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Globalisation, Corporate Governance and Firm Productivity

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Abstract

We examine the relationship between globalisation, corporate governance and firm productivity by breaking down total effects into direct and indirect effects. The estimation results, using longitudinal data from Korea, indicate that the positive effect of liberalising equity ownership on firms' total factor productivity (TFP) was reinforced by indirect managerial effects when a firm improved its corporate governance. Our findings also confirm that the interaction of the managerial effect with increased foreign equity ownership is more significant than interaction with exports, suggesting that liberalising foreign investment in the host market is more effective in capitalising on the potential benefits of corporate governance reform than increasing exports to overseas markets, reflected in learning by exporting.

Key words: corporate governance reform; globalisation; productivity; Korea

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1. Introduction

Asian corporations have come to play a significant role in the global market (Peng, Bhagat & Chang, 2009), but have proved vulnerable to financial shocks (Forbes, 2004). Recurrent financial crises have highlighted the importance of corporate governance and managerial effort in improving firm productivity in a rapidly globalising Asia. The purpose of this paper is to examine the association between corporate governance, globalisation and a firm's total factor productivity (TFP) by disentangling total effects into direct and indirect effects. To realize our purpose, we use longitudinal data for Korea, where firms' level of globalisation, measured by foreign equity ownership and exports, and corporate governance systems have changed significantly since the 1990s. Most existing corporate governance studies examine the relationship between corporate governance and share price or accounting performance.[1] In contrast to the existing literature on accounting profits and/or share price effects of corporate governance, we examine the real consequences of changes in corporate governance, measured in terms of effects on a firm's TFP.

There is much literature on the relationship between globalisation and TFP (see the survey in Tybout, 2000). However, there are few studies on how globalisation, particularly foreign ownership, affects firm productivity. A contribution of this paper is that, for the first time in the literature, we examine how managerial effects act as a conduit through which foreign equity ownership affects TFP. The

[1] Most of the existing literature suggests a positive association between corporate governance and accounting performance (see Morck, Wolfenzen & Yeung, 2005; Perez-Gonzalez, 2006 for surveys). Studies of Korean firms based on this approach have produced similar results. Joh (2003) explored changes in accounting profits associated with corporate governance failure in Korean firms before the 1997 financial crisis. Black, Jang and Kim (2006) reported that the share price of a firm increased sharply with the appointment of outside directors to more than 50 per cent of positions on the board. Park and Kim (2008) reported that the effectiveness of corporate governance on firms' financial performance is bound to the institutional context created by government regulation.

originality of this paper is that it emphasises the importance of managerial effort as a determinant of different input combinations and in shifting the production function.

Empirically, this paper extends Koke and Renneboog (2005) and Kose, Prasad and Terrones (2008) by focusing on the association between corporate governance, TFP and globalisation. However, this paper differs from Koke and Renneboog's (2005) study in the following three respects. First, we consider the effect of both corporate governance and globalization on TFP, where globalisation was not considered by Koke and Renneboog (2005). Second, Koke and Renneboog's (2005) measure of productivity was based on the traditional index-based measurement, which relies heavily on the assumption of perfect competition in factor markets and efficiency in resource allocation. The traditional index based measurement is also subject to problems relating to aggregation of inputs across agents and over time (Bartelsman & Doms, 2000). In view of these problems, this paper, following Olley and Pakes (1996) and Levinsohn and Petrin (2003), presents estimates of productivity that are based on the production function, explicitly taking into account estimation bias caused by simultaneity of productivity and factor demand. Third, in view of the studies by Doidge, Karolyi, and Stulz (2007) and Aguilera and Jackson (2003), which demonstrated that country-specific factors are important in understanding corporate governance, this paper focuses on Korean listed industrial firms that have experienced dramatic change in both their degree of globalisation and corporate governance system, which presents a different context from that of stable advanced economies.

This paper also differs from Kose, Prasad and Terrones (2008) in that our focus is on the association between globalisation and productivity together with corporate governance in order to analyse indirect managerial effects. This approach enables us to investigate the channel through which globalisation affects productivity.

Moreover, our estimation uses firm-based data, rather than country-level aggregated data, which allows us to estimate firm productivity using advanced estimation methods in order to minimise possible endogeneity biases.

Our contribution also differs from other recent related studies examining firm productivity growth. Baldwin and Yan (2012) examine the effect of market expansion on productivity growth, but do not consider either the role of corporate governance or globalisation. Similarly, Marrocu, Paci and Pontis (2012) examine the role of internal intangible capital on firms' productivity, but do not consider either the role of corporate governance or globalisation effects.

Foreshadowing our main results, we first find that the effects of globalisation on firm productivity are higher when globalisation is measured in terms of foreign equity ownership than exports. In the main results we find that a one standard deviation increase in foreign equity ownership increases average firm productivity more than a corresponding increase in exports by almost a factor of two. Second we find that globalisation improves firm productivity more in firms with better corporate governance arrangements and that this relationship is stronger when globalisation is measured in terms of foreign equity ownership than exports. To be specific, a 10 per cent increase in foreign equity ownership increases firm productivity by 9 per cent in firms with good corporate governance compared with 4 per cent in firms with poor corporate governance, while the corresponding figures for a 10 per cent increase in exports are 2.67 per cent and 0.67 per cent respectively. This result suggests that liberalising foreign investment in the host market is more effective in capitalising on the potential benefits of corporate governance reform than increasing exports.

The layout of this paper is as follows. The next section describes the Korean context. In Section 3 we outline existing theories on the relationship between

corporate governance, globalisation and firm productivity. This section presents our analytical framework, testable hypotheses and empirical specification used to test those hypotheses. In section 4 we describe the data. The results are presented in Section 5. The final section concludes with a summary of the results.

2. The Korean Context

It is well known that the achievements of the Korean economy are largely due to its outward development strategies since the 1960s (see Amsden, 1989, among others). To secure foreign currency, exports were encouraged through various monetary and fiscal subsidies. In particular, the focus on heavy and chemical industries (HCI) strategically pursued in the 1970s reinforced the position of the existing business groups and promoted the formation of a number of new business groups. The government protected entrepreneurs' ownership and managerial control by limiting foreign ownership to 10 per cent and prohibiting (hostile) mergers and acquisitions (M&As) based on an expectation that these groups would foster HCI.

The Korean government began to open equity markets to foreign investors in 1992 when the economy required foreign capital because of accumulated current account deficits. However, the extent of foreign equity ownership was limited due to the restriction that foreigners not hold more than 50 per cent of the issued shares in Korean companies. The 1997 financial crisis, and the subsequent reforms, were a turning point that led to the relaxation of most restrictions on foreign ownership. The regulations governing foreign investors' ownership of Korean firms were almost completely removed. Foreign equity investment has been liberalized, such that since May 1998 there are no restrictions, except for those industries involving national security concerns or cultural sensitivities, such as the mass media.

While Korean development was based on export-driven growth from the 1960s and equity markets have been liberalised since the early 1990s, most Korean firms had weak corporate governance systems until the onset of the 1997 financial crisis. Virtually all of the (unitary) boards of directors (BOD) of Korean firms were appointed internally, and the controlling shareholder of the chaebol, as a non registered board member, held a significant amount of economic (and political) power (Kim & Kim, 2008). This power was backed up by his/her tenured position, which resulted from the complicated ownership arrangements between chaebol affiliates. Consequently, internally appointed board members tended to act as rubber stamps, and failed to monitor the actions of the controlling shareholder, even when resources were being squandered due to tunnelling and empire building.

Following the 1997 financial crisis, however, a nation-wide reform began. Laws were amended to improve corporate governance and reform the chaebols. An outside director system was introduced to improve the monitoring function of company boards. In February 1998, the Listing Act was amended to require all listed firms, excluding the Korean Securities Dealers Automated Quotations (KOSDAQ), to appoint at least one outside director, with outside directors to comprise no less than a quarter of board members by the time of the firm's Annual General Meeting (AGM) in 1999. This means that all listed firms must have a minimum of one outside director, and the number of additional outside members required depends on the size of the existing board. Following the first wave of reforms, focused on streamlining the business practices of chaebols in 1998 and 1999, the Korean government introduced a second wave of reforms, including amendments to the Securities and Exchange Law, in March 2001 and December 2003. These revisions of the Acts stipulate by law the 1998 Listing Act's requirement for outside directors for all listed firms on both the

Korea Exchange and the KOSDAQ (except for venture capital companies with an asset size of 100 billion won or less). They specifically require (1) large listed corporations to establish an Audit Committee and Appointment Committee under the BOD that is comprised mainly of outside directors, (2) that no fewer than half the board members of large firms should be outside directors, and (3) that large firms listed on the Korea Exchange and KOSDAQ should have at least three outside directors and at least half the board positions should be filled by outside directors.

Owing to these regulatory reforms to board structure and the development of a market for outside directors, listed firms began to appoint outside directors in 1999. Table 1 shows the proportion of outside directors in firms on the Korea Exchange. Table 1 indicates that the proportion of listed firms with at least one outside director increased significantly from 34 per cent in 1999 to 62.3 per cent in 2000 and to 95 per cent in 2007. Both introduction of the new regulations and the development of a market for outside directors were main reasons for this sharp increase. The table also shows that the most common number of outside directors per firm was two.

Insert Table 1 & Fig. 1

Figure 1 shows trends in the size of the BOD, the number of outside directors (left axis) and the ratio of outside directors to total board members on the BOD (right axis) between 1999 and 2007. It illustrates that the number of outside directors, compared to total board members, increased significantly over this period of time. The ratio of outside directors to total members on the BOD has continued to increase and reached 0.33 in 2007. This increase reflected the firms' strategic choice to downsize their boards (i.e. the denominator), coupled with the appointment of outside directors (i.e. the numerator) to comply with regulatory requirements.

3. Research Hypotheses and Estimation Model

3.1 Literature Review and Hypotheses Development

Permitting foreign equity ownership potentially has several advantages in terms of enhancing firm productivity. It improves resource allocation, bringing so-called indirect collateral benefits (Mishkin, 2006). These collateral benefits include development of the domestic financial sector to facilitate corporate financing, improvements in institutions, and better macroeconomic policies (Kose, Prasad & Terrones, 2008). Certain types of capital inflows, such as FDI, often defined as foreign equity ownership of more than 10 per cent, can increase productivity in the host economy through technology diffusion and vertical spillovers (see Keller, 2004 and references therein) and technology creation through multinational companies activities. Bloom and Van Reenen (2007) illustrated that multinational enterprises share their productivity abroad by transplanting their organisation structures and management practices. This internal transfer will be preferred to the extent that the market fails due to asymmetric information between buyers and sellers of the technology (see Markusen, 1995 among others) and/or firm-specific assets (Dunning, 1993). Further, this direct investment can generate productivity spillovers for other domestic companies horizontally in the same industries (Blomstrom, Kokko & Zejan, 2000). Vertical integration can also increase productivity in the host economy, due partly to imported intermediate goods (Markusen & Venables, 1999; Amiti & Konings, 2007). Horizontal, or intra-industry, spillovers refer to technology diffusion through the movement of workers within industries, learning-by-observing and promoting competition, whereas vertical spillovers refer to inter-industry diffusion through buyer-supplier linkages, either in upstream or downstream industries. Burstein and Monge-Naranjo (2009) found that firm-embedded productivity, such as

management know-how, accounted for around 16 per cent of output differences between FDI source and host countries. This suggests the following hypothesis:

H1: Increased foreign equity ownership has a positive effect on firm productivity.

In addition to these well-established arguments, we particularly note that foreign equity ownership can improve the host economy's corporate governance structure and institutions, defined broadly. Martin (1978) and Martin and Page (1983) illustrated that an increase in competitive pressures, due to globalisation, could improve intra-firm efficiency. This is similar to Leibenstein's (1966, 1978) concept of 'X-inefficiency', which is defined as the difference between actual productivity and the maximum feasible productivity. Holmstrom and Kaplan (2005) suggest that a less effective corporate governance system tends to lead to lower productivity growth. Enhancement in productivity could either be from imitation and/or direct intervention from foreign investors. It is natural for foreign investors to protect their investment as a form of risk management and thus to demand better corporate governance.

The corporate governance literature suggests that better corporate governance will positively affect firm productivity by providing managerial incentives to improve allocative efficiency, input combination and productive-enhancing investment with lower cost of capital. Differences in corporate governance might lead to divergence in managerial behaviour and different evolution of firm productivity paths. Doidge, Karolyi and Stulz (2007) and Coffee (1984) follow Stigler's price dispersion argument from the 1960s, and contend that corporate governance improves the allocative efficiency of the factor (capital) market. This in turn implies improved productivity. Good corporate governance helps to resolve market failures caused by asymmetric information and thus enables firms to access capital markets on better

terms. Bartelsman and Doms (2000) point out that a firm's (managerial) decisions, including input choices, is one of the determinants of its productivity.

Combining the individual positive effects of corporate governance and foreign equity ownership on firm productivity allows us to consider interaction effects. We call this the managerial vigilance effect of foreign equity ownership. Increased foreign equity ownership, coupled with improved corporate governance, can either influence management directly (i.e. via FDI) or increase participation of foreign ownership in business decisions and influence the selection of management. This suggests our second hypothesis:

H2: Liberalising equity ownership will have a stronger positive effect on productivity in firms with better corporate governance than with poor corporate governance.

Trade liberalisation can also have a positive effect on TFP through a learning-by-exporting effect (see eg. De Loecker, 2007; Takii, 2005; Fernandes, 2007; Baldwin & Gu, 2004 and references therein). First, export orientation enables firms to leverage their existing capabilities across countries and create scale economies otherwise not available domestically. Second, firms may learn about new technologies by exporting to knowledgeable buyers who share product designs and production techniques. Third, participation in export markets brings firms into contact with international best practices, which fosters learning and productivity growth. Fourth, participation in export markets may provide incentives to improve efficiency because of the intensity of international competition. As competition is related to high innovation and productivity growth, foreign competition provides a mechanism through which exporting raises productivity growth. Thus, we have our third hypothesis:

H3: Increased exports have a positive effect on firm productivity.

Heterogeneous firm trade models suggest that internationalisation has a positive effect on the productivity of some firms, while simultaneously forcing other firms to exit the market (see eg. Melitz, 2003). While one would expect that exporting and investing in productivity are complementary activities, it remains that exporting activity also makes firms more susceptible to international demand shocks, meaning that exporting activity is an additional source of uncertainty for the firm. Amore and Zaldokas' (2011) results suggest that corporate governance is one of the main factors determining which firms are likely to benefit from trade liberalization. Firms with better corporate governance are better placed to take advantage of complementarities between exporting and investing in productivity and are less susceptible to international demands shocks that might force them to exit the industry.

Productivity growth will be higher in exporters that develop the absorptive capacities to take advantage of productivity gains associated with innovation. Better levels of investor protection are positively related to investment in research and development (Hillier, Pindado, de Queiroz & de la Torre, 2009). Firms with better corporate governance will be more likely to develop those absorptive capacities, because they will be more likely to invest in research and development. Given these arguments, we suggest a fourth hypothesis:

H4: Increased exports will have a stronger positive effect on productivity in firms with better corporate governance than in firms with poor corporate governance

3.2 Estimation Model

To test our research hypotheses consider the following unobserved effects model with an interaction variable.

$$TFP_{it} = \alpha Governance_{it} + \delta Globalisation_{it} + \psi Governance_{it} \times Globalisation_{it} + \\ + \boldsymbol{\mu}_s + \upsilon_i + \mathbf{x}_{it}^{'}\boldsymbol{\beta} + \varepsilon_{it} \quad (1)$$

here *i* indexes firms from 1 to *N* and *t* indexes time periods (years) from 1 to *T*. *TFP*, *Governance* and *Globalisation* refer respectively to firm total factor productivity, corporate governance and globalisation activities through liberalising equity ownership and exports. α and ψ respectively capture the effect of corporate governance and its interaction with globalisation activities, which are of primary interest in this research. The year-specific effect is measured by $\sum_{s=1}^{T} \boldsymbol{\mu}_s \cdot 1[t = s]$ $\{1[t = s]\}_{s=1}^{T}$, where the indicator function of [ ] is one if the condition of [ ] is satisfied and zero otherwise. While we are not directly interested in the estimated coefficients of time-specific variables, year-specific variables capture effects that are specific to the period in which they occur but common to all firms, including various macroeconomic and political shocks. υ_i captures time invariant unobserved firm-specific effects. The firm-specific unobservable effects control for managerial style and/or work environment. For example, business group LG in Korea emphasises 'harmony' as its work culture, whereas Samsung stresses 'organisational power' and Hyundai a 'can do' approach. Further to this standard estimation model, following Cornwell, Schmidt, and Sickles' (1990), we also include a time trend to capture the evolving nature of productivity.

$\boldsymbol{\beta}$ represents a vector of coefficients associated with a vector of time-varying observed regressors at the firm level, $\mathbf{x}_{it}^{'}$. $\mathbf{x}_{it}$ includes R&D investment (McGuckin, Streitwieser & Doms, 1998), market structure (Syverson, 2004), human capital and the quality of the workforce (Doms, Dunne & Troske, 1997) as well as the regulatory environment (Brown, Earle & Telegdy, 2006).

4. Data and Measurement of Dependent Variable

We employed longitudinal data for publicly traded Korean firms over the period 1990-2007. The three key variables of interest are estimated productivity, which is the dependent variable, outside directors, which is a proxy for corporate governance, and foreign equity ownership and exports, which are both proxies for globalisation. Data for the estimation of productivity were collected from the Japan Center for Economic Research (JCER) database and the Korea Listed Companies Association (KLCA), whereas data for the independent variables are largely from the KLCA database.

4.1 Productivity as the Dependent Variable

The JCER database provides gross output, intermediate inputs, labor and capital stock in real values. Gross output, intermediate inputs and capital stock are in million won and converted into 1990 values as a base using the appropriate price index, including intermediate goods and the material deflator provided by the Bank of Korea (BOK). Labor inputs, in thousand-hours calculated by the number of employees, were obtained from each firm's financial statements and industry average labor hours were obtained from the Monthly Labor Survey of Korea, Ministry of Labor and the Korea Information Service (KIS). To calculate capital costs, the database used interest rates from the BOK, own capital ratio from KIS (financial statement) and deflators for building and structure, machinery, tools and vehicles from the BOK. If a company was delisted in a particular year, that company was not included in the database in subsequent years. Thus, the number of listed firms varied on an annual basis. We included industrial firms only, which left us with 15,392 firm-year observations. In addition, we obtained information about electricity and water energy costs from the KLCA database. To make them consistent with JCER data, the data from the KLCA were deflated using the production price index for fuel energy provided by the BOK.

Table 2 presents data on the average value of outputs and aggregate inputs. Table 2 indicates that the natural logarithm of average output for listed firms increased over the sample period: from 11.21 in 1990 to 12.11 in 2007. The table also shows that Korean listed firms reduced their labor intensive production, due mainly to greater use of capital. Firms' use of labor has continued to decline, while their use of capital has increased before declining to some extent since 2000. The pattern of water and energy use by firms was similar to that of capital use, and the use of intermediate goods continued to increase over the same period.

Insert Table 2

To calculate productivity we follow the following two steps. First, we identify parameters in an estimation model suggested by Olley and Pakes (1996) and Levinsohn and Petrin (2003). This entails selecting a proxy variable to correct for simultaneity bias. Olley and Pakes (1996) use firm investment to correct the simultaneity bias between the input choices of firms and privately known productivity. However, using investment for this purpose is potentially problematic given that investment is lumpy, which may bias annual estimates of productivity. Levinsohn and Petrin (2003) suggested employing intermediate inputs, such as fuel and energy, to control for that part of productivity observed by the firm's decision maker and correlated with input choice. This overcomes the lumpiness problem caused by inverting the investment function as in Olley and Pakes (1996).

We used the Levinsohn and Petrin estimator in all benchmark estimations, while the Olley-Pakes estimator, coupled with the fourth order polynomial expansion method, was employed as a robustness check. For the Levinsohn and Petrin method, the natural log of labor was used as a freely-variable input, the natural log of electricity was employed as the proxy variable and the natural log of capital stock was

employed as the state variable. The dependent variable in this model specification is the natural log of gross output, proxied by the natural log of total sales in real terms. Coefficients for the freely variable input, proxy and state variables were obtained via GMM estimation with contemporaneous natural log of capital and lag-one of the proxy variable as instruments. Second, armed with the estimated parameters from the first stage, we calculated the SIC 4-digit industry-demeaned productivity level following the method suggested by Van Biesebroeck (2007).

4.2 Corporate Governance and Globalisation Proxies

The KLCA database provides a wide range of information including balance sheet, income statement, stock price, auditor's opinion, and general information about stock-listed and KOSDAQ-listed corporations. Our data set excluded KOSDAQ-listed firms and financial companies to increase comparability between firms.

The KLCA database provides information on both the numbers of outside directors and total board members from 1999. We included outside directors who had their own office in a firm as well as those who did not have their own office, although the majority of outside directors are external. The database provides information on the percentage of equity owned by foreigners. Domestic firms' exports are also obtained from the KLCA database in domestic currency.

Corporate governance was proxied by the appointment of outside directors, combined with the ratio of outside directors to board members. Specifically, we define a binary variable as one when a firm appointed at least one outside director(s) and zero otherwise. An advantage of this binary definition for corporate governance is that it allows us to interpret its interaction variables more clearly than with a continuous variable. In an attempt to overcome the limitation of this binary variable, we also use the ratio of outside directors in the board to examine the effect of the

density of outside directors. We measure the extent of a firm's globalisation by (1) foreign ownership, calculated by the proportion of total issued stock owned by foreign investors, and (2) exports, denoted as exports as a percentage of total sales.

Table 3 shows that both the average number of outside directors and the proportion of outside directors on the board have increased since 2000. The average number of outside directors (the ratio of outside directors on the BOD) for listed firms has increased from 1.35 (0.21) in 2000 to 2.22 (0.35) in 2007. This increase was due largely to changes in legal requirements, including the Listing Act and the Securities and Exchange Acts described above.

Table 3 also shows that foreign equity ownership in domestic firms in 2007 was around five times higher than in 1990, due largely to liberalised foreign ownership and improvements in the reputation of Korean firms in the global market. The average listed firm's ratio of exports to total sales also increased until 2000, before declining marginally since the mid 2000s. This decline may reflect resurgence in protectionism by Korea's major export markets, including the United States, in response to the deterioration in their current account balances.

Insert Table 3
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5. Results

5.1 Benchmark Estimation: Without Interaction Variable

Firm TFP in all specifications, except the robustness checks, were estimated by the Levinsohn and Petrin estimator using GMM. Table 4 presents the baseline estimates The coefficients on outside directors in Table 4 indicate the magnitude of the difference between the TFP of firms with at least one outside director and firms with no outside directors. The estimation results, based on the restricted regression (Models 1 and 2), imply that the productivity premium for a firm with good corporate

governance is 0.05-0.08. This is equivalent to a 3-5 per cent premium on the mean value of TFP. There are two caveats to interpreting this result. First, the statistical significance of the estimated coefficient of corporate governance is not robust. Model (2) includes time effects in addition to the unobserved firm-specific effects to control for year-specific shocks affecting all firms in the same way. The coefficient on outside directors in Model (1) is insignificant, while the estimated coefficient on outside directors in Model (2) is marginally significant. In addition, Models (1) and (2) largely reflect the 'total' amount of association between outside directors and productivity, as the models have no (time-varying) control variables. In other words, it shows the direct effect of outside directors as well as the indirect effect through the omitted intervening variable. Thus, it may capture a spurious association.

Insert Table 4

Models (3) and (4) include a foreign ownership variable and other time-varying control variables. The coefficients on outside directors in (3) and (4) are no longer significant at the conventional level, whereas foreign ownership is significant. The preferred model (Model (4)) indicates that an increase of ten per cent in foreign ownership, given other control variables, improves TFP by around 6 per cent of its mean value. A similar outcome was found when we used the ratio of exports to sales as a proxy for globalisation, although the magnitude of the estimated coefficient was smaller than that for foreign ownership. Models (4) and (6) provide support for the effect of globalisation on firm productivity, consistent with *H1* and *H3*. To compare the economic effects of foreign investment and exports, we standardised these variables so that the coefficients represent the estimated increase in population mean TFP when the variables increase by one standard deviation. A one standard deviation increase in foreign equity ownership increased mean TFP more than a corresponding

increase in exports by almost a factor of two. Most other variables are not significant, apart from industry concentration, proxied by the Hirfindahl-Hirschman index (HHI).

5.2 Benchmark Estimation 2: Separating Total Effects with an Interaction Variable

The results in Table 5 examine the interaction effects between corporate governance and globalisation, proxied by either the share of foreign ownership in issued stocks (Models 1-3) or the ratio of exports to sales (Models 4-6).

First, the results in rows 2 and 4 show that the interaction variables are significant at the 1 per cent level, irrespective of model specification and the proxies for globalisation. Statistics for the *F*-test for the joint null of the outside directors and the interaction variables, as well as the outside directors and globalisation variables, were large enough to reject the null hypothesis of no effect at the 1 per cent level.

The results from Model (3) imply that an increase of ten percentage points in foreign equity ownership is associated with a 9 per cent increase in the mean TFP of firms with good corporate governance and 4 per cent in the mean TFP of firms with poor governance. This result is consistent with *H2*. The difference in TFP increases is due to (indirect) managerial effects in conjunction with liberalisation as indicated by the estimated coefficient of the interaction variable. Estimated coefficients also imply that the liberalisation effect through managerial vigilance is greater than the direct effect of the liberalisation itself. Our result supports Kose, Prasad and Terrones' (2008) findings and confirms the estimation results without interaction variables in Table 4. The magnitude of the estimated coefficient of foreign ownership in Table 5, however, is smaller than that in Table 4. This is because the total (positive) effect of foreign ownership is divided into (positive) direct and (positive) indirect effects. The positive sign of the estimated coefficient indicates that foreign investors' equity investment is associated with improved allocative efficiency, spillover effects and better access to

new technology (Blomstrom, Kokko & Zejan, 2000). More importantly, the significance of the interaction variable between foreign ownership and corporate governance, measured by the appointment of outside directors, illustrates that the positive direct effect of foreign investment on TFP was reinforced by a positive indirect effect occurring through managerial vigilance, consistent with *H1* and *H2*.

The last three columns report the relationship between exports with TFP in conjunction with corporate governance. The results in Models (5) and (6) show that the direct effect of exports was not significant at the conventional level, whereas interaction of exports with corporate governance was significant at the 1 per cent level. This suggests that the improvement in TFP resulting from learning-by-exporting in the global market associated with exports may not be sizeable, which is confirmed by Bernad and Jensen (1995) for the United States and Clerides, Lach and Tybout (1998) for Colombia and Morocco. The results in the table, however, imply that export-led competitive pressure in the global market exists. The results from Model (6) imply that an increase of ten percentage points in exports is associated with a 2.67 per cent increase in the mean TFP of firms with good corporate governance and 0.67 per cent in the mean TFP of firms with poor governance, which is consistent with *H4*.

When these findings are considered together, we find that the direct positive effect on firm TFP of improved corporate governance through the appointment of outside directors is not robust, but that an indirect positive effect occurs through interaction with the firm's globalisation activities, consistent with *H2* and *H4*. In particular, the results suggest that the interaction effect due to the liberalisation of foreign ownership *(H2)* is greater than that due to export activities *(H4)*.

Insert Table 5

5.3 Effects of the Proportion of Outside Directors

The outside directors variable, defined dichotomously, is useful to interpret the interaction variable clearly and to examine the difference between firms with outside directors and firms without them. However, it has limitations in analysing the effect of the density of outside directors. To examine the linearity of the managerial effect on productivity, we generated two additional binary variables. One indicates a group of firms having BODs with a high density of outside directors and the other group with a low density of outside directors. The threshold levels for high and low density outside directors were respectively the 75 percentile and 25 percentile values on the spectrum representing the ratio of outside directors to total directors on the BOD.

We expect that if a high proportion of outside directors are desirable for monitoring managers, and thus productivity, the improvement in TFP of firms with a high density of outside directors would be greater than that of firms with a low density of outside directors. The results in Table 6 support this proposition, as indicated by the second and third rows in the upper panel (i.e., Low Density of Outside Directors) and the second row in the middle panel (i.e. High Density of Outside Directors). The interaction variable for the low density firms, $OD2BOD^{25pc} \times ForeignOwn$, is not significant. By contrast, the coefficient of the interaction variable for the high density firms, $OD2BOD^{75pc} \times ForeignOwn$, is significant at the 10 per cent level and the total effect (including both direct and interaction effects) of a high proportion of outside directors based on the mean value of foreign ownership is greater than that for a firm with poor corporate governance by 0.12 units of TFP. When we use exports as a proxy of globalisation, the interaction term is significant for both the low density and high density of outside directors. The magnitude of the coefficient of $OD2BOD^{75pc} \times Export$ was greater than that of $OD2BOD^{25pc} \times Export$. This finding

implies that the effect of outside directors interacting with the firm's liberalising ownership strategies on TFP is linear as there was little positive interaction effects for the firm with a low density of outside directors, whereas there was significant positive interaction effects for firms with a high density of outside directors.

Insert Table 6

5.4 Chaebol Affiliates versus Independent Firms

Schulze et al. (2003) highlighted the importance of ownership dispersion among the directors of private family firms. Given the importance of chaebols and power of the controlling shareholder of chaebols (Chang & Hong, 2003), we conjecture that the productivity effect of globalisation may be more attenuated in chaebol affiliates than in independent firms. In the past, the controlling shareholders of chaebols exercised power directly over the firm's production decisions, as well as indirectly by controlling the management of affiliates by holding tenured positions without legal responsibility. Excessive investment for building a business empire might have resulted in tunnelling and inefficiency (Chang, 2003; Bae, Kang & Kim, 2002; Joh, 2003). Many of the amendments to laws following the 1997 crisis sought to rectify this problem, including a legal requirement for the controlling shareholder to be a registered board member and the strengthening of minority shareholder rights.

To examine any difference between chaebol affiliates and stand-alone firms, we divided the sample into two groups: firms belonging to the Korea Fair Trade Commission-designated chaebols and others. The results, reported in Table 7, indicate that the indirect effect of improved corporate governance through the appointment of outside directors interacting with globalisation is more prominent for independent firms than for chaebol affiliates. Both $OD \times ForeignOwn$ and $OD \times Exports$ for chaebol

affiliates were not significant, but they were significant at the conventional level for the independent firms. However, the chi-square test between the two coefficients was 0.15, so we could not reject the hypothesis that the estimated coefficients are not different.

The results also indicate that the positive Shumpeterian effect of monopolistic firms on TFP was more significant for chaebol affiliates than for independent firms, but the vintage effect of capital stock operated in the opposite direction. The negative coefficient on the variable denoting patent costs for chaebol affiliates may suggest that purchasing patents from another company through arm's length transactions dilutes a firm's R&D efforts and thus has a negative effect on productivity.

Insert Table 7

5.5 Treatment of Autocorrelation

To examine possible serial correlation over time, we re-estimated the baseline model with interaction variables after explicitly considering the first-order autoregressive model.[2] Table 8 reports our results. The interaction effects of improved corporate governance, measured by the appointment of outside directors, and foreign ownership ($OD \times ForeignOwn$) remained significant regardless of model specification. The *F*-statistic for the joint null of outside directors and its interaction with foreign ownership is also large enough to reject the null hypothesis at the conventional level. By contrast, the interaction variable, $OD \times Exports$, was not significant, although the export variable itself, given other control variables, was significant in Model (6). This finding also confirms that the interaction of the managerial effect with foreign ownership is more significant than its interaction with arm's length competition through exports.

[2] The estimation method included two steps: estimation of the first-order autocorrelation to remove the effect of the AR (1) error and mean-difference to eliminate firm-specific effects.

Insert Table 8

In estimates, which are not reported, we included a time trend and found similar estimation results. We also explicitly considered a binary variable, defined as one if the year was 1997 or 1998 and zero otherwise, to capture the effect of the financial crisis. The estimated coefficient of this crisis variable from the baseline estimation with interaction variables was significant for Models (2) and (4) of the six model specifications. However, the statistical significance of the estimated coefficients of the interaction variables across the models remained similar to the baseline estimation, although the magnitude of the coefficients fell by a small margin.

5.6 Treatment of Endogeneity Bias

We considered three possible causes of endogeneity problems. The first was the correlation between the included regressors and unobserved firm-specific factors, and this was addressed by the within estimator. An example of this correlation would be the situation where a particular managerial style or firm image either attracts or deters foreign investment and overseas demand for the firm's outputs as well as TFP. The second and third concerns were estimation bias caused by self-selection and reverse causality. Self-selection bias arises either from the estimation of the TFP and/or from the estimation of Equation (1). The former can be addressed through employing either the Olley and Pakes (1996) or Levinsohn and Petrin (2003) method.

In terms of the estimation of Equation (1), the appointment of outside directors in Korea was largely driven by legal requirements, whereby selection bias is not the major concern. However, a firm's globalisation strategy could be a choice variable

rather than a matter of obligation.[3] A firm's choice of globalisation strategy also depends on productivity, whereby reverse causality causes an endogeneity problem. Foreign investors' investment decisions, for example, may depend on a firm's past productivity. In this context, Gourinchas and Jeanne (2007) provide evidence against such reverse causality by showing that, among developing economies, net capital inflows are negatively correlated with productivity growth. Further to this evidence, we re-estimated the baseline estimation assuming that foreign investment and exports were endogenous variables. Instead of an *ad hoc* type regression with a lagged (suspected) endogenous variable, we used the instrumental variable method. The results are reported in Table 9. Foreign ownership, exports and their interaction variables were treated as endogenous. The instrumental variables used include first and second lags of endogenous variables as well as net profit per share for all models and dividend payout ratio for foreign ownership for Models 1 and 2. Similar to the findings in Gourinchas and Jeanne (2007), the results suggest that endogeneity bias due to reverse causality is not a major concern in Table 5. Both interaction variables, $OD \times ForeignOwn$ and $OD \times Exports$ remained significant with the expected signs.

Insert Table 9

5.7 Alternative Measure of Productivity

As a robustness check on our baseline estimation using the Levinsohn and Petrin (2003) method, we estimated TFP using the Olley and Pakes (1996) estimator (with minor modification), which inverts the investment function.[4] The results are reported

[3] A more rigorous analysis of the cause and effect relationship between exports and productivity requires knowledge of the clearly defined initial timing of a firm's exports, which is beyond the scope of our sample period for most firms.

[4] Our estimates do not consider the potential estimation bias caused by a firm's self-selective exit due to absence of exit information from our databases. The inverted investment function gives an observable expression for productivity in the production function. First, we ran a regression to estimate the

in Table 10. Similar to the baseline specification reported in Table 5, all interaction variables remained significant at the conventional level for *OD*×*ForeignOwn* (and at the 10 per cent level for *OD*×*Exports*). *Foreign Ownership* was significant irrespective of model specification, whereas the robustness of the *Exports* variable was sensitive to model specification. These findings again show that the direct effect of the appointment of outside director/s itself on TFP could be open to debate, but its indirect effect (i.e. managerial vigilance) when interacted with globalisation (foreign ownership or exports) is important, consistent with *H2* and *H4*.

Insert Table 10
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6. Conclusion

Examining the relationship between corporate governance, globalisation and firm productivity is an important issue, as evidenced by the 1997 Asian financial crisis. This paper explored the managerial vigilance effect of liberalising equity ownership, arguing that any positive effects of foreign equity ownership on TFP will be enhanced when improved corporate governance leads to a better managerial effect. To achieve this goal, we disentangled the effect of the interaction between foreign equity ownership and corporate governance on TFP from the total effects. Exploring real consequences (i.e. effects on productivity) differentiates our paper from most of the extant corporate governance literature that focuses on accounting/financial variables. Moreover, in contrast to existing literature on globalisation and TFP, we also explicitly took account of managerial effects associated with liberalising foreign ownership.

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coefficient on the natural log of labor coupled with intermediate goods, measured by water and energy costs, and the coefficient of capital by the combination of investment and capital for fourth order expansion. We also tested the third order expansion, but the estimates did not change.

The results based on longitudinal data from Korea, where equity ownership and corporate governance systems have changed significantly since the 1990s, indicate that the positive effect of liberalisation on firm TFP was strengthened by indirect managerial effects when a firm improved its corporate governance arrangements. Our results also indicate that this channelling effect is monotonic in that both the appointment of outside directors and the proportion of outside directors on the board are important in determining the interaction effect. In addition, our findings confirm that the interaction of the managerial effect with increased foreign equity ownership is more significant than interaction with arm's length competition from exports. Therefore, we conclude that liberalising foreign equity ownership (in a small, open economy) is more effective in capitalising on the potential benefits of corporate governance by generating managerial effects than increasing exports to overseas markets.

Further investigation revealed that the effect of the interaction between indirect managerial incentives and foreign equity ownership was more evident for independent firms than for chaebol affiliates. However, the differences between the interaction variables for the two sets of firms were not statistically significant, implying that this finding is tentative, rather than conclusive. Consideration of the different managerial responses to increased foreign ownership between chaebol affiliates and independent firms, if any, is an interesting research question that awaits future research.

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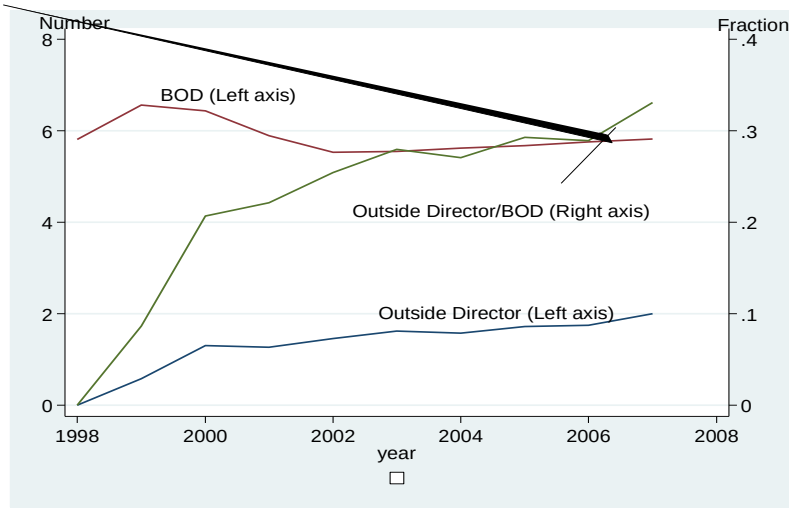
TABLE 1: Outside directors in corporations listed on the Korea exchange (%)

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Total Listed Corporations	100	100	100	100	100	100	100	100	100
Firms without outside director	66.0	37.7	34.6	29.6	22.4	23.6	17.9	17.6	5.7
Firms with at least one outside director	34.0	62.3	65.4	70.4	77.6	76.4	82.1	82.4	94.3
No. of outside directors per firm									
= 1	16.4	19.0	22.5	22.8	24.1	23.5	26.9	28.1	32.4
= 2	10.2	27.0	28.1	30.1	32.5	31.0	32.5	29.1	33.7
≥ 3	7.3	16.3	14.7	17.5	21.1	22.0	22.8	25.2	28.1

Notes: Discrepancies, if any, between the total number at the bottom and in row 3 are due to rounding errors. Compilation was based on the KLCA database. We dropped firms if the size of the BOD is zero.

FIGURE 1: Trends in the size of the BOD, number of outside directors and ratio of outside directors to total directors on the BOD for listed firms



Notes: The left and right axes respectively refer to the number of members on the BOD and the number of outside directors, and the ratio of outside directors/total directors on the BOD.

TABLE 2: Average values of the logarithm of output and production inputs

	1990	1995	2000	2005	2007
Ln (output)	11.21	11.73	11.94	12.07	12.11
(standard deviation)	(1.30)	(1.32)	(1.37)	(1.49)	(1.56)
{25, 75 percentiles}	{10.2,12.0}	{10.7,12.4}	{10.8,12.3}	{11.1,12.7}	{11.1,12.9}
[# of observation]	[372]	[384]	[393]	[413]	[401]
Ln (intermediate)	11.1	11.4	11.7	11.85	11.92
(standard deviation)	(1.29)	(1.37)	(1.37)	(1.47)	(1.54)
{25, 75 percentiles}	{10.1,11.8}	{10.5,12.1}	{10.8,12.3}	{10.9,12.4}	{10.9,12.7}
[# of observation]	[372]	[384]	[393]	[413]	[402]
Ln (capital)	10.12	10.67	11.13	10.91	10.86
(standard deviation)	(1.44)	(1.50)	(1.59)	(1.67)	(1.80)
{25, 75 percentiles}	{9.1,11.0}	{9.5,11.5}	{10.0,11.9}	{9.8,11.7}	{9.7,11.7}
[# of observation]	[372]	[384]	[393]	[413]	[405]
Ln (labor)	7.56	7.49	7.25	6.98	6.92
(standard deviation)	(1.18)	(1.18)	(1.17)	(1.30)	(1.40)
{25, 75 percentiles}	{6.6,8.3}	{6.6,8.2}	{6.47,7.89}	{6.15,7.64}	{6.0,7.6}
[# of observation]	[372]	[384]	[393]	[413]	[395]
Ln (electricity)	9.83	9.96	9.66	9.37	9.22
(standard deviation)	(1.91)	(1.96)	(2.41)	(3.68)	(4.34)
{25, 75 percentiles}	{8.5,11.0}	{8.6,11.2}	{8.4,10.9}	{8.3,11.0}	{8.1,11.0}
[# of observation]	[365]	[373]	[381]	[387]	[387]
Ln (water_energy)	6.28	6.60	6.62	6.46	6.25
(standard deviation)	(1.78)	(2.07)	(1.98)	(2.0)	(2.1)
{25, 75 percentiles}	{5.1,7.3}	{5.3,8.0}	{5.4,7.9}	{5.1,7.7}	{5.1,7.6}
[# of observation]	[293]	[319]	[327]	[335]	[323]

Sources: JCER database and KLCA database

TABLE 3: Board structure and globalisation indicators (average values)

	1990	1995	2000	2005	2007
Outside Directors	0.00	0.00	1.35	1.88	2.22
(standard deviation)	(0.00)	(0.00)	(1.46)	(1.63)	(1.65)
{25, 75 percentiles}	{0.00,0.00}	{0.00,0.00}	{0.00,2.00}	{1.00,2.00}	{1.00,3.00}
[# of observation]	[530]	[552]	[610]	[656]	[672]
Outside Director/Board	0.00	0.00	0.21	0.30	0.35
(standard deviation)	(0.00)	(0.00)	(0.17)	(0.17)	(0.16)
{25, 75 percentiles}	{0.00,0.00}	{0.00,0.00}	{0.00,0.30}	{0.25,0.40}	{0.25,0.43}
[# of observation]	[530]	[552]	[576]	[634]	[668]
Foreign Ownership	2.03	6.09	5.52	10.75	10.87
(standard deviation)	(6.77)	(8.54)	(11.83)	(15.8)	(14.64)
{25, 75 percentiles}	{0.00,0.02}	{0.25,9.75}	{0.01,4.58}	{0.21,16.9}	{0.48,16.3}
[# of observation]	[293]	[332]	[388]	[408]	[400]
Export/Sales	13.84	21.65	31.02	30.94	29.35
(standard deviation)	(24.21)	(26.43)	(28.71)	(29.8)	(29.9)
{25, 75 percentiles}	{0.00,17.37}	{0.00,34.8}	{4.2,50.2}	{3.1,55.3}	{1.63,56.7}
[# of observation]	[368]	[382]	[393]	[413]	[414]

Source: KLCA database

TABLE 4: Baseline estimates without interaction variable

			Foreign Ownership		Export	
	(1)	(2)	(3)	(4)	(5)	(6)
Outside Director(OD)	0.052	0.082*	0.061	0.061	0.077*	0.071*
	[0.106]	[0.050]	[0.137]	[0.139]	[0.078]	[0.100]
Foreign Ownership			0.010***	0.009***		
			[0.000]	[0.000]		
Exports					0.001	0.002**
					[0.205]	[0.029]
HHI				0.006***		0.006***
				[0.004]		[0.002]
R&D				0.023		0.018
				[0.660]		[0.724]
Firm Age				0.008		0.010
				[0.426]		[0.670]
Firm Age2				-0.000**		-0.000**
				[0.036]		[0.040]
Regulation				-0.019		-0.015
				[0.367]		[0.495]
Training				0.008		0.009
				[0.214]		[0.206]
Skilled Labor				0.214		0.220
				[0.277]		[0.269]
Patent Cost				-0.100		-0.113
				[0.462]		[0.389]
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	Yes	Yes	Yes	Yes	Yes
N	4561	4561	4384	4361	4561	4385
R^2	0.245	0.260	0.420	0.436	0.410	0.422

Notes: p-values in brackets are based on cluster-correlation adjusted estimator. ***, ** and * denote significance at the 1%, 5% and 10% levels respectively. R-squared is based on within variation. Constant value is not shown for brevity. Outside director is a binary variable with a value of 1 if a firm has appointed at least one outside director and zero otherwise. Foreign ownership is the percentage of foreign-owned shares out of total issued shares. HHI is the Herfindahl-Hirschman index based on the 4-digit industry classification. R&D is a binary variable with a value of 1 if a firm's R&D ratio, measured by the ratio of research and development expenditure to sales multiplied by 100, is in the highest quartile, and zero otherwise. Firm age and Firm age squared respectively show the time lapsed since the firm's establishment and its square. Regulation is proxied by the sum of the government's and public enterprise's ownership as a percentage of total shares outstanding. Training refers to (training cost divided by employee number)/100. Skilled labor is proxied by white-collar employees divided by total number of employees. Patent cost is calculated by 100*(patent cost/sales). Exports are exports scaled by sales in home currency.

TABLE 5: Baseline estimation with interaction variables

	Foreign Ownership			Exports		
	(1)	(2)	(3)	(4)	(5)	(6)
Outside Director(OD)	-0.008	0.012	0.016	-0.037	-0.035	-0.034
	[0.848]	[0.770]	[0.692]	[0.405]	[0.442]	[0.435]
OD×ForeignOwn	0.013***	0.008**	0.008**			
	[0.001]	[0.011]	[0.014]			
Foreign Ownership		0.006***	0.006***			
		[0.003]	[0.003]			
OD×Exports				0.004***	0.004***	0.003***
				[0.003]	[0.005]	[0.004]
Exports					0.000	0.001
					[0.775]	[0.165]
HHI			0.006***			0.006***
			[0.005]			[0.002]
R&D			0.019			0.023
			[0.711]			[0.666]
Firm Age			0.048***			0.048**
			[0.002]			[0.011]
Firm Age2			-0.000**			-0.000*
			[0.042]			[0.068]
Regulation			-0.020			-0.016
			[0.326]			[0.458]
Training			0.008			0.010
			[0.217]			[0.160]
Skilled Labor			0.227			0.250
			[0.251]			[0.210]
Patent Cost			-0.099			-0.106
			[0.451]			[0.422]
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	4384	4384	4361	4561	4561	4395
R^2	0.421	0.425	0.440	0.416	0.416	0.428

Notes: ***, ** and * denote significance at the 1%, 5% and 10% levels respectively. p-values in brackets are based on cluster-correlation adjusted estimator. The R-squared is based on within variation. Constant value is not shown for brevity. OD×ForeignOwn and OD×Exports refer to the interaction between outside directors and foreign ownership and between outside directors and exports respectively. Refer to Table 4 for definitions of other variables.

TABLE 6: Estimates testing for linearity effects

	(1)	(2)	(3)	(4)
Low Density of Outside Directors				
$OD2BOD^{25pc}$	-0.092**		-0.149***	
	[0.031]		[0.002]	
$OD2BOD^{25pc} \times ForeignOwn$	0.002			
	[0.195]			
Foreign Ownership	0.008***	0.008***		
	[0.005]	[0.000]		
$OD2BOD^{25pc} \times Export$			0.002***	
			[0.003]	
Export			0.001	0.002**
			[0.127]	[0.040]
High Density of Outside Directors				
$OD2BOD^{75pc}$		0.063		0.017
		[0.414]		[0.856]
$OD2BOD^{75pc} \times ForeignOwn$		0.009*		
		[0.072]		
$OD2BOD^{75pc} \times Export$				0.004*
				[0.051]
Other Control Variables				
HHI	0.006***	0.006***	0.006***	0.006***
	[0.004]	[0.005]	[0.002]	[0.002]
R&D	0.022	0.014	0.015	0.012
	[0.674]	[0.780]	[0.777]	[0.831]
Firm Age	0.052	0.010	0.019	-0.015
	[0.300]	[0.338]	[0.405]	[0.643]
Firm Age2	-0.000**	-0.000**	-0.000*	-0.000*
	[0.030]	[0.047]	[0.056]	[0.051]
Regulation	-0.017	-0.018	-0.014	-0.015
	[0.403]	[0.404]	[0.585]	[0.479]
Training	0.009	0.008	0.010	0.009
	[0.195]	[0.229]	[0.185]	[0.194]
Skilled Labor	0.208	0.234	0.221	0.238
	[0.293]	[0.238]	[0.265]	[0.233]
Patent Cost	-0.116	-0.089	-0.125	-0.107
	[0.416]	[0.505]	[0.386]	[0.856]
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
N	4361	4361	4385	4385
R^2	0.436	0.439	0.425	0.427

Notes: ***, ** and * denote significance at the 1%, 5% and 10% levels respectively. p-values in brackets are based on cluster-correlation adjusted estimator. The R-squared is based on within variation. Constant value is not shown for brevity. $OD2BOD^{25pc}$ and $OD2BOD^{75pc}$ refer respectively to low density of outside directors and high

density of outside directors with threshold values of the 25 percentile and 75 percentile on the spectrum representing the ratio of outside directors to total directors BOD. Refer to Table 4 for the definitions of other variables.

TABLE 7: Results for chaebol affiliates and independent firms

	Foreign Ownership		Exports	
	Affiliate (1)	Independent firm (2)	Affiliate (3)	Independent firm (4)
Outside Director (OD)	0.248*	-0.025	0.196	-0.079
	[0.050]	[0.520]	[0.103]	[0.104]
OD×ForeignOwn	0.005	0.007**		
	[0.436]	[0.011]		
Foreign Ownership	0.013**	0.003*		
	[0.020]	[0.079]		
OD×Exports			0.003	0.003**
			[0.342]	[0.022]
Exports			0.004	0.001
			[0.283]	[0.556]
HHI	0.019***	0.005**	0.022***	0.005**
	[0.007]	[0.020]	[0.007]	[0.011]
R&D	0.011	-0.015	-0.005	-0.011
	[0.926]	[0.693]	[0.968]	[0.780]
Firm Age	0.046	0.073***	0.022	0.098***
	[0.323]	[0.020]	[0.678]	[0.000]
Firm Age2	0.000	-0.000**	0.000	-0.000**
	[0.831]	[0.015]	[0.945]	[0.019]
Regulation	-0.016	-0.036	-0.014	-0.033
	[0.785]	[0.132]	[0.812]	[0.192]
Training	0.000	0.009	0.005	0.010
	[0.998]	[0.197]	[0.777]	[0.186]
Patent Cost	-0.258***	0.103	-0.282***	0.073
	[0.000]	[0.558]	[0.000]	[0.650]
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
N	1123	3238	1135	3258
R^2	0.475	0.492	0.455	0.482

Notes: ***, ** and * denote significance at the 1%, 5% and 10% levels respectively. p-values in brackets are based on cluster-correlation adjusted estimator. R^2 is based on within variation. Constant value is not shown for brevity. OD×ForeignOwn and OD×Exports refer to the interaction between outside director/s and foreign ownership and between outside director/s and exports respectively. Refer to Table 4 for the definitions of other variables.

TABLE 8: Results with first-order autocorrelation

	(1)	(2)	(3)	(4)	(5)	(6)
Outside Director(OD)	-0.011	-0.004	-0.003	-0.005	-0.002	0.008
	[0.580]	[0.848]	[0.867]	[0.826]	[0.940]	[0.739]
OD×ForeignOwn	0.004***	0.003**	0.003***			
	[0.000]	[0.030]	[0.007]			
Foreign Ownership		0.003***	0.002***			
		[0.003]	[0.005]			
OD×Exports				0.001	0.001	0.000
				[0.176]	[0.274]	[0.568]
Exports					0.000	0.001***
					[0.372]	[0.004]
HHI			0.006***			0.006***
			[0.000]			[0.000]
R&D			0.009			0.004
			[0.616]			[0.836]
Firm Age			0.014			0.003
			[0.498]			[0.928]
Firm Age2			-0.001**			-0.000**
			[0.011]			[0.025]
Regulation			-0.009			-0.009
			[0.481]			[0.496]
Training			0.000			0.000
			[0.997]			[0.951]
Skilled Labor			0.001			0.029
			[0.994]			[0.692]
Patent Cost			0.035			0.034
			[0.761]			[0.764]
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	3993	3993	3974	4167	4167	3991
R^2	0.201	0.203	0.216	0.195	0.195	0.208

Notes: p-values in brackets are based on cluster-correlation adjusted estimator. ***, ** and * denote significance at the 1%, 5% and 10% levels respectively. The R-squared is based on within variation. Constant value is not shown.

TABLE 9: Instrumental variable estimation for baseline with interaction variables

	(1)	(2)	(3)	(4)
Outside Director(OD)	-0.262*	-0.215	-0.691*	-0.696*
	[0.088]	[0.147]	[0.052]	[0.058]
OD×ForeignOwn	0.051**	0.043*		
	[0.042]	[0.073]		
Foreign Ownership	-0.008	-0.005		
	[0.316]	[0.468]		
OD×Exports			0.023**	0.023**
			[0.035]	[0.041]
Exports			0.000	0.001
			[0.969]	[0.506]
HHI		0.005***		0.008***
		[0.000]		[0.000]
R&D		-0.006		0.053
		[0.875]		[0.122]
Firm Age		0.047		0.009
		[0.262]		[0.859]
Firm Age2		-0.000***		0.000
		[0.002]		[0.961]
Regulation		-0.028		-0.017
		[0.157]		[0.371]
Training		0.005		0.017***
		[0.236]		[0.005]
Skilled Labor		0.228**		0.348***
		[0.023]		[0.007]
Patent Cost		-0.023		-0.085
		[0.914]		[0.647]
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
N	3548	3542	3733	3718
R^2	0.259	0.319	0.182	0.203

Notes: p-values in brackets are based on the cluster-correlation adjusted estimator. ***, ** and * denotes significance at the 1%, 5% and 10% levels respectively. R-squared is based on within variation. Constant value is not shown for brevity. Foreign ownership, exports and their interaction variables are regarded as endogenous. The instrument variables used include first and second lags of own (endogenous suspected) variables as well as net profit per share for all models (and dividend payout ratio for foreign ownership for Models 1 and 2.

TABLE 10: Results for the baseline model with different measure of productivity

	Foreign Ownership			Exports		
	(1)	(2)	(3)	(4)	(5)	(6)
Outside Director (OD)	0.051	-0.064	-0.052	-0.140*	-0.100	-0.107
	[0.324]	[0.238]	[0.314]	[0.076]	[0.238]	[0.194]
OD×ForeignOwn	0.022***	0.016**	0.011**			
	[0.005]	[0.019]	[0.010]			
Foreign Ownership		0.012***	0.016**			
		[0.009]	[0.020]			
OD×Exports				0.007***	0.006*	0.006*
				[0.009]	[0.074]	[0.064]
Exports					0.003	0.005***
					[0.152]	[0.009]
HHI			0.006***			0.007***
			[0.002]			[0.001]
R&D			0.024			0.042
			[0.694]			[0.516]
Firm Age			0.097***			0.169**
			[0.000]			[0.010]
Firm Age2			-0.000***			-0.000**
			[0.009]			[0.041]
Regulation			-0.054			-0.066
			[0.248]			[0.215]
Training			0.001			0.002
			[0.368]			[0.283]
Patent Cost			-0.411**			-0.432***
			[0.014]			[0.004]
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	5246	5246	5228	5680	5680	5280
R^2	0.329	0.339	0.358	0.336	0.338	0.340

Notes: ***, ** and * denote significance at the 1%, 5% and 10% levels respectively. p-values in brackets are based on the cluster-correlation adjusted estimator. R-squared is based on within variation. Constant value is not shown for brevity. See Tables 4 and 5 for definitions of the variables.